CLAIMS:

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1. A PWM waveform-generator apparatus in which a series of pre-determined pulse widths are modulated in accordance with a pre-determined protocol, comprising:

means for generating a plurality of on/off timing-based interrupts;

means for generating a force on/off action-based interrupt having a programmable control;

means for generating a force on/off action-based interrupt having an external control; and,

means for interpreting said generated plurality of timing-based interrupts and said at least one action-based interrupt such that the series of pulse widths of the PWM waveform generator are modulated in accordance with said protocol.

2. The PWM waveform-generator apparatus of claim 1, wherein:

the means for generating a plurality of on/off timing-based interrupts is a programmable on-off-control part;

the means for generating a force on/off action-based interrupt having a programmable control is the programmable on-off control part;

the means for generating a force on/off action-based interrupt having an external control is selection from the group consisting of an external force_on action and an external force_off action; and,

the interpreting means is a multiple-event-interrupts part comprising a software interrupt routine for handling each timing-based and action-based interrupt.

3. The PWM waveform generator apparatus of claim 2, wherein said programmable on-off-control part comprises:

an on-time control comprising a first timer and a first comparator; and
an off-time control comprising a second timer and second comparator,
wherein the on-time control is enabled for a first period and the off-time control is disabled
when the PWM is high and the off-time control is enabled for a second period and the on-

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time control is disabled when the PWM is low, such that the first and second control are alternately enabled and disabled.

- 4. The PWM waveform generator apparatus of claim 3, wherein: for on/off timing said protocol comprises at least one of:
 - a programmable on-pulse width Min on parameter control,
 - a programmable on-period Max on parameter control,
 - a programmable off-pulse width Min_off parameter control,
 - a programmable off-period Max_off parameter control,
 - at least one event control selected from a programmable event control for triggering a force-off event and an external event control for triggering a force-off event,
 - at least one event control selected from a programmable event control for triggering a force-on event and an external event control for triggering a force-on event,

wherein at least one of a force-on event and a force-off event can be triggered in an onperiod and in an off-period.

- 5. The PWM waveform-generator apparatus of claim 4, wherein:
 the first timer and second timer respectively comprises a first and third register;
 the first and second comparator respectively comprises a second and fourth register;
 wherein, when the on-time control is enabled,
 - a. the second register has been pre-loaded by the on-time control with a compare value equal to a pre-determined minimum on-width (minimum on-time Min_on) of the PWM, the first register has been pre-loaded with a predetermined maximum on-width (maximum on-time Max_on) of the PWM such that there is no delay time for loading said first and second register,
 - b. a first interrupt is triggered by the first comparator when the second register equals the compare value and a second interrupt is triggered by the first timer when the first register equals a pre-determined first period, at least one action-based interrupt can be triggered at least once during one period of the PWM according to the pre-determined protocol, thereby turning off the PWM by the on-time control when at least one of the

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second interrupt and the at least one action-based interrupt is triggered and the first interrupt is triggered, and

when the off-time control is enabled

- c. the fourth register has been pre-loaded with a compare value equal to a predetermined minimum off-width (minimum off-time Min_off) of the PWM, the third register has been pre-loaded with a predetermined maximum off-width (maximum off-time Max_off) of the PWM such that there is no delay time for loading said third and fourth register,
- d. a third interrupt is triggered by the second comparator when the fourth register equals the compare value and a fourth interrupt is triggered by the second timer when the third register equals the pre-determined second period, at least one action-based interrupt can be triggered at least once during one period of the PWM according to the pre-determined protocol, thereby turning on the PWM by the off-time control when at least one of the fourth interrupt and theat least one action-based interrupt is triggered and the third interrupt is triggered.
 - 6. A microprocessor for performing the programmable on-off control and the software interrupt routines as claimed in claim 2.
- 7. A method of programmable control of a PWM generator in which a signal is modulated as a series of on/off pulses each having a width and a period in accordance with a pre-determined protocol, comprising the steps of:

providing a pre-determined protocol for a series of pulse widths and periods;

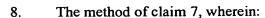
generating a plurality of on/off timing-based interrupts in accordance with the provided protocol;

generating at least one force on/off action-based interrupt in accordance with the provided protocol;

interpreting said generated plurality of timing-based interrupts and said at least one action-based interrupt in accordance with said protocol.

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the step of generating a plurality of on/off interrupts further comprises the steps of:

- a. providing a programmable-on-off-control part, and
- b. controlling the generation of said plurality of on/off timing-based interrupts
 by the provided programmable on-off control part;

the step of generating at least one force on/off action-based interrupt further comprises at least one of the steps of:

- c. generating the at least one force on/off action-based interrupt by the provided programmable on-off control part;
 - d. performing the substeps of:
 - 1. providing an external control for the generation of the at least one force on/off action-based interrupt; and
 - 2. generating the at least one force on/off action-based interrupt by the provided external control.
- 9. The method of claim 8, wherein the interpreting step further comprises the steps of:
 - e. providing a multiple event-interrupts part; and
- f. controlling the interpretation of at least one action-based interrupt by the provided multiple event-interrupts part.

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